La Niña and the Upcoming 2010-2011 Winter Season

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Status of
La Niña

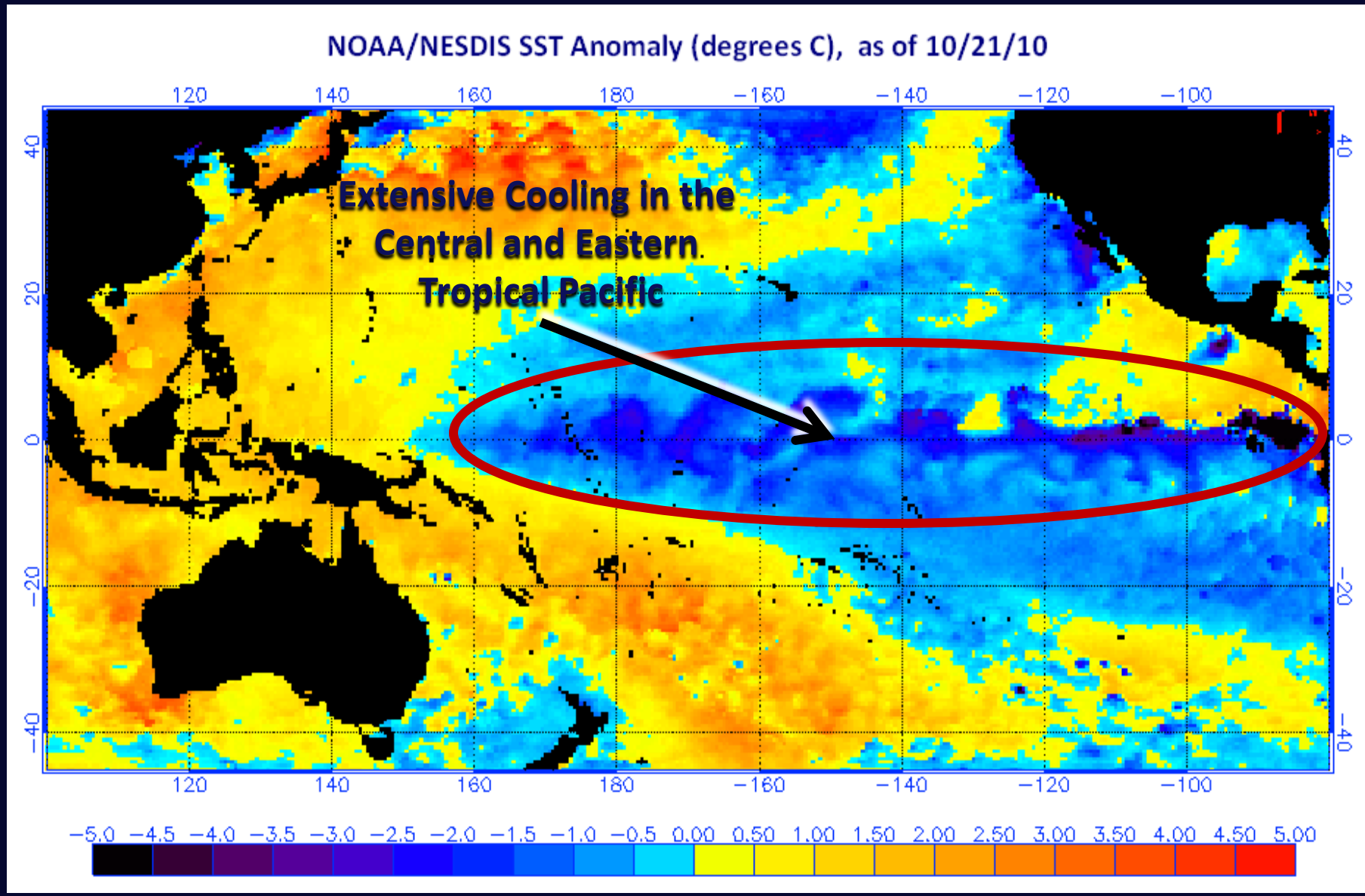
Overview

- La Niña conditions persist in the central and eastern tropical Pacific Ocean.
- Sea surface temperatures (SSTs) in the tropical Pacific from near the International date line to the west coast of South America have ranged from -0.5C to -2.0C below average since late September.
- Recent Equatorial Pacific SST trends and model forecasts indicate that this La Niña will strengthen in the next couple of months and will continue at least through the Northern Hemisphere spring of 2011.

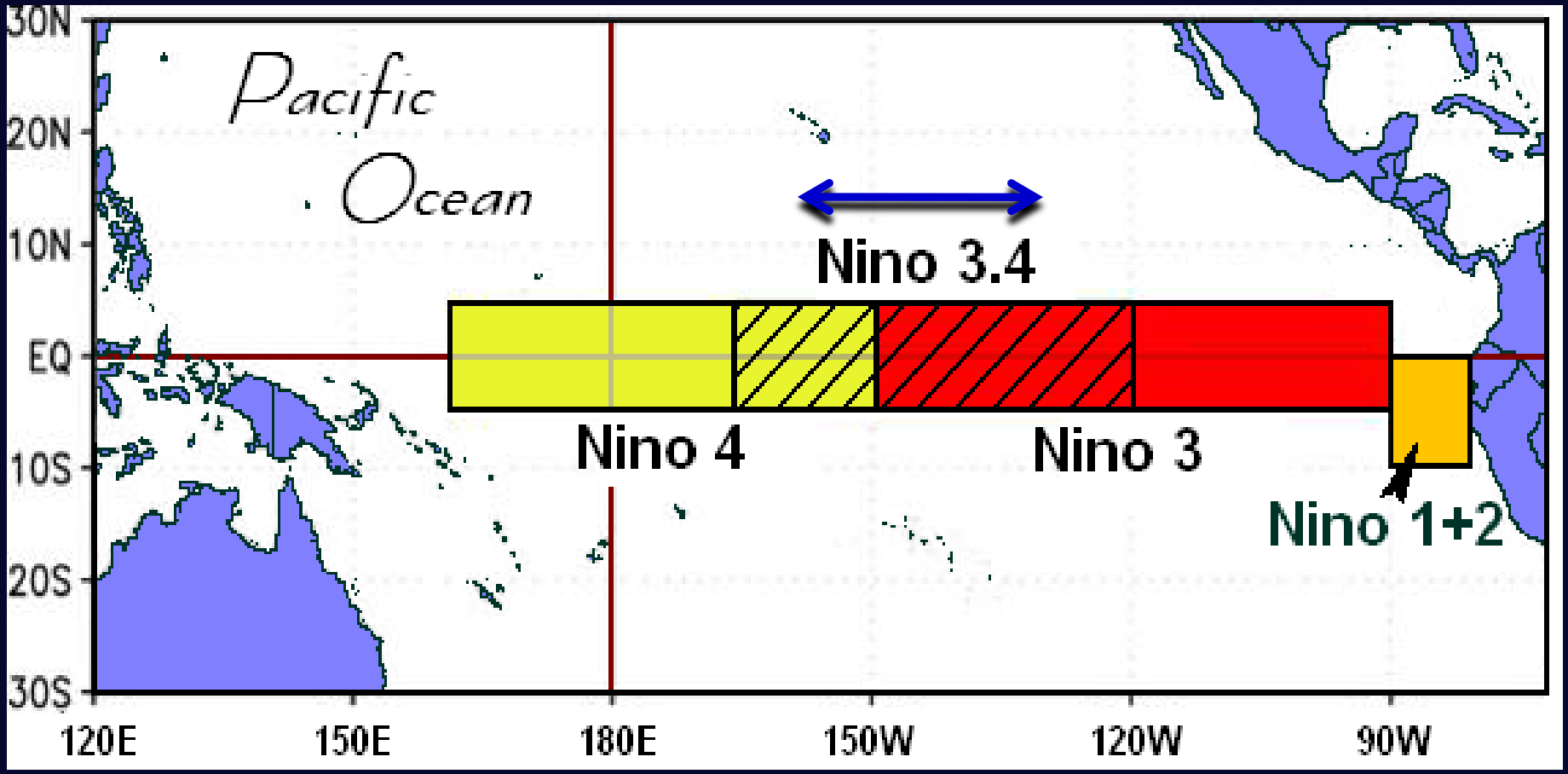
Overview

- However, there remains some disagreement among the models over the eventual strength of this La Niña. A majority of the 23 climate models (dynamical and statistical models) predict a moderate-to-strong La Niña for the Northern Hemisphere winter.

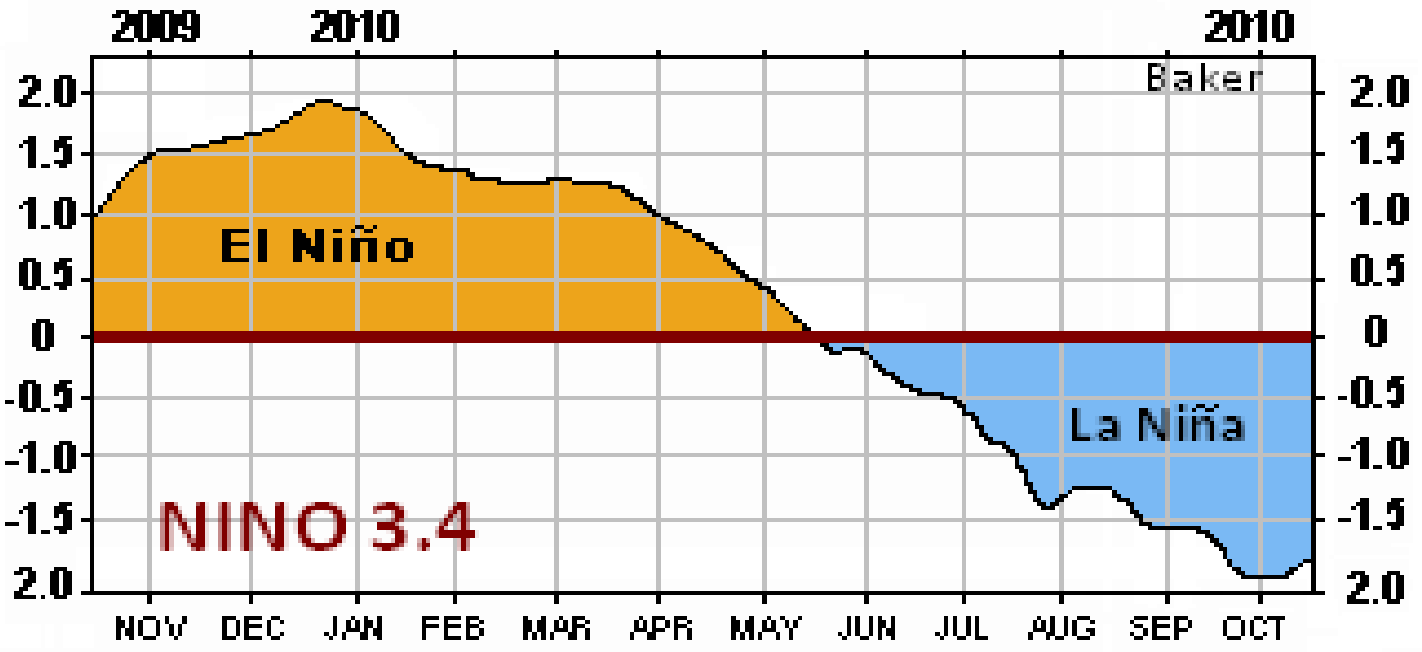
- Given the strong cooling observed in the central and eastern Tropical Pacific over the last few months and the apparent ocean-atmosphere coupling (positive feedback), the outcome offered by the majority of the models is favored at this time.


NOAA/NESDIS SST Anomaly (degrees C), as of 10/21/10
120
140
160
180
−160
−140
−120
−100
40
20
0
−20
−40
Extensive Cooling in the
Central and Eastern
Tropical Pacific
−5.0 −4.5 −4.0 −3.5 −3.0 −2.5 −2.0 −1.5 −1.0 −0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00

Niño Regions in the Tropical Pacific Ocean



Nino 3.4 – The principal region in the eastern tropical Pacific used by the Climate Prediction Center (CPC) for monitoring, assessing and predicting ENSO.

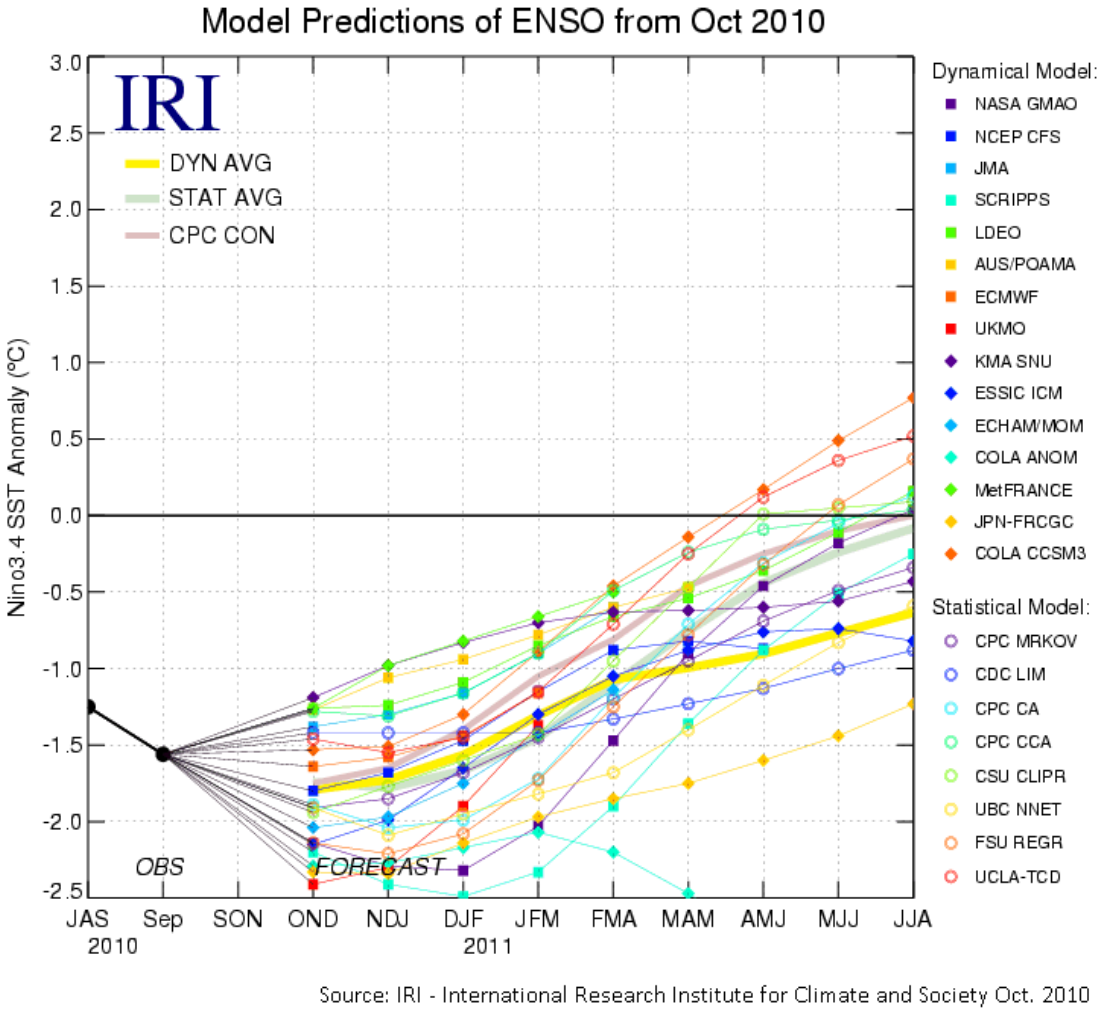


SST Anomaly (degrees C) for NINO 3.4
as of Oct 15, 2010

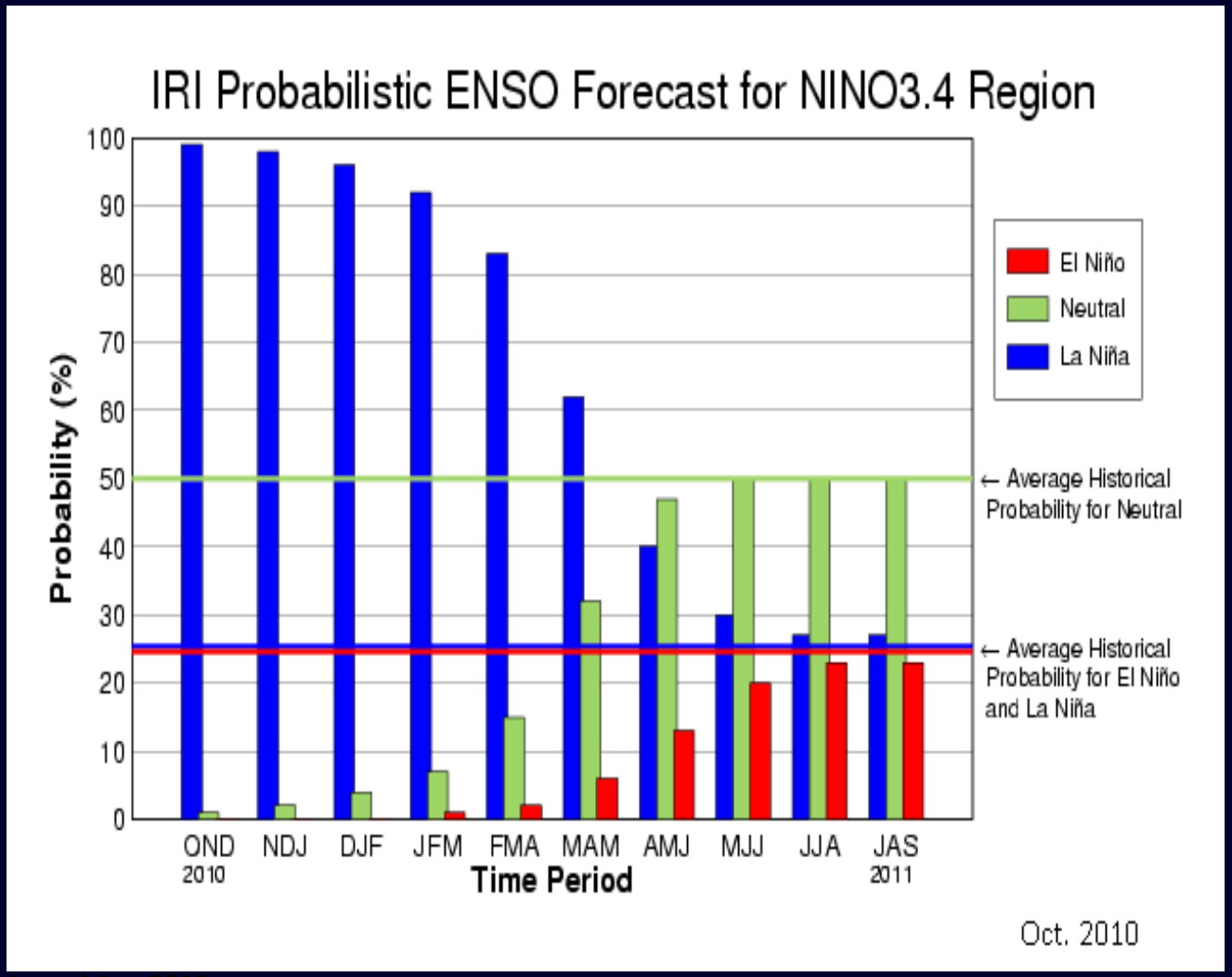
Source: NOAA/Climate Prediction Center

Abnormally cool sea surface temperatures (SSTs) in NINO 3.4 observed late last summer and early this fall are consistent with the development of a La Niña. SSTs have continued to cool with minor rises along the way. As of October 15, the average SSTa for Niño 3.4 was -1.5˚C.

Pacific Niño 3.4 ENSO Outlook



- All 23 dynamical and statistical models indicate that La Niña conditions (Niño-3.4 SST anomalies -0.5 C or less) will persist into the Northern Hemisphere spring of 2011. A majority of the models forecast La Niña to strengthen during the next few months, with many of those indicating a strong La Niña by the November-December-January climate season.



Issued Aug 2010

The probability of La Niña, El Niño and non-ENSO or neutral conditions for the next nine 3-month climate periods

This table from IRI shows a greater than 90% probability that the current La Niña will persist in the Niño 3.4 Region at least through the 2011 January-February-March climate period.

Oceanic Niño Index (ONI)

- The **ONI** is based on SST departures from average in the Niño 3.4 region, and is a principal measure for monitoring, assessing, and predicting ENSO.
- Defined as the three-month running-mean SST departures in the Niño 3.4 region.
- Used to place current events into a historical perspective
- **NOAA's operational definitions of El Niño and La Niña are keyed to the ONI index.**

NOAA Operational Definitions for El Niño and La Niña

El Niño: characterized by a *positive* ONI greater than or equal to +0.5 C.

La Niña: characterized by a *negative* ONI less than or equal to –0.5 C.

By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

CPC considers El Niño or La Niña conditions to occur when the monthly Niño3.4 OISST departures meet or exceed +/- 0.5°C along with consistent atmospheric features. These anomalies must also be forecasted to persist for 3 consecutive months.

Oceanic Niño Index - ONI

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2000	-1.6	-1.4	-1	-0.8	-0.6	-0.5	-0.4	-0.4	-0.4	-0.5	-0.6	-0.7
2001	-0.6	-0.5	-0.4	-0.2	-0.1	0.1	0.2	0.2	0.1	0	-0.1	-0.1
2002	-0.1	0.1	0.2	0.4	0.7	0.8	0.9	1	1.1	1.3	1.5	1.4
2003	1.2	0.9	0.5	0.1	-0.1	0.1	0.4	0.5	0.6	0.5	0.6	0.4
2004	0.4	0.3	0.2	0.2	0.3	0.5	0.7	0.8	0.9	0.8	0.8	0.8
2005	0.7	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.2	-0.1	-0.4	-0.7
2006	-0.7	-0.6	-0.4	-0.1	0.1	0.2	0.3	0.5	0.6	0.9	1.1	1.1
2007	0.8	0.4	0.1	-0.1	-0.1	-0.1	-0.1	-0.4	-0.7	-1	-1.1	-1.3
2008	-1.4	-1.4	-1.1	-0.8	-0.6	-0.4	-0.1	0	0	0	-0.3	-0.6
2009	-0.8	-0.7	-0.5	-0.1	0.2	0.6	0.7	0.8	0.9	1.2	1.5	1.8
2010	1.7	1.5	1.2	0.8	0.3	-0.2	-0.6	-1.0	?			

Not Yet Available

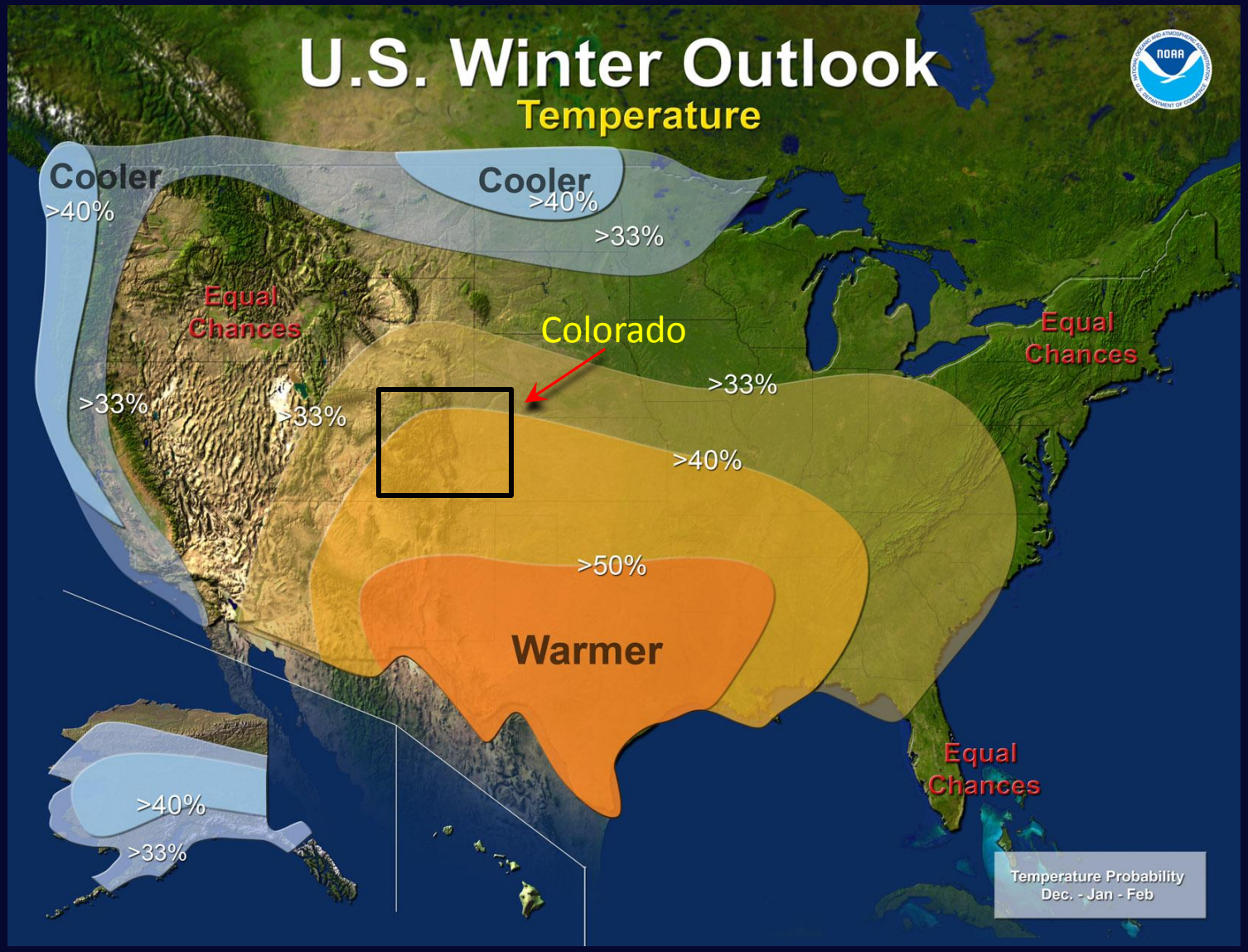
Warm Episodes - El Niños (in RED): ONI 0.5 and above

Cold Episodes - La Niñas (In Blue): ONI of -0.5 and below

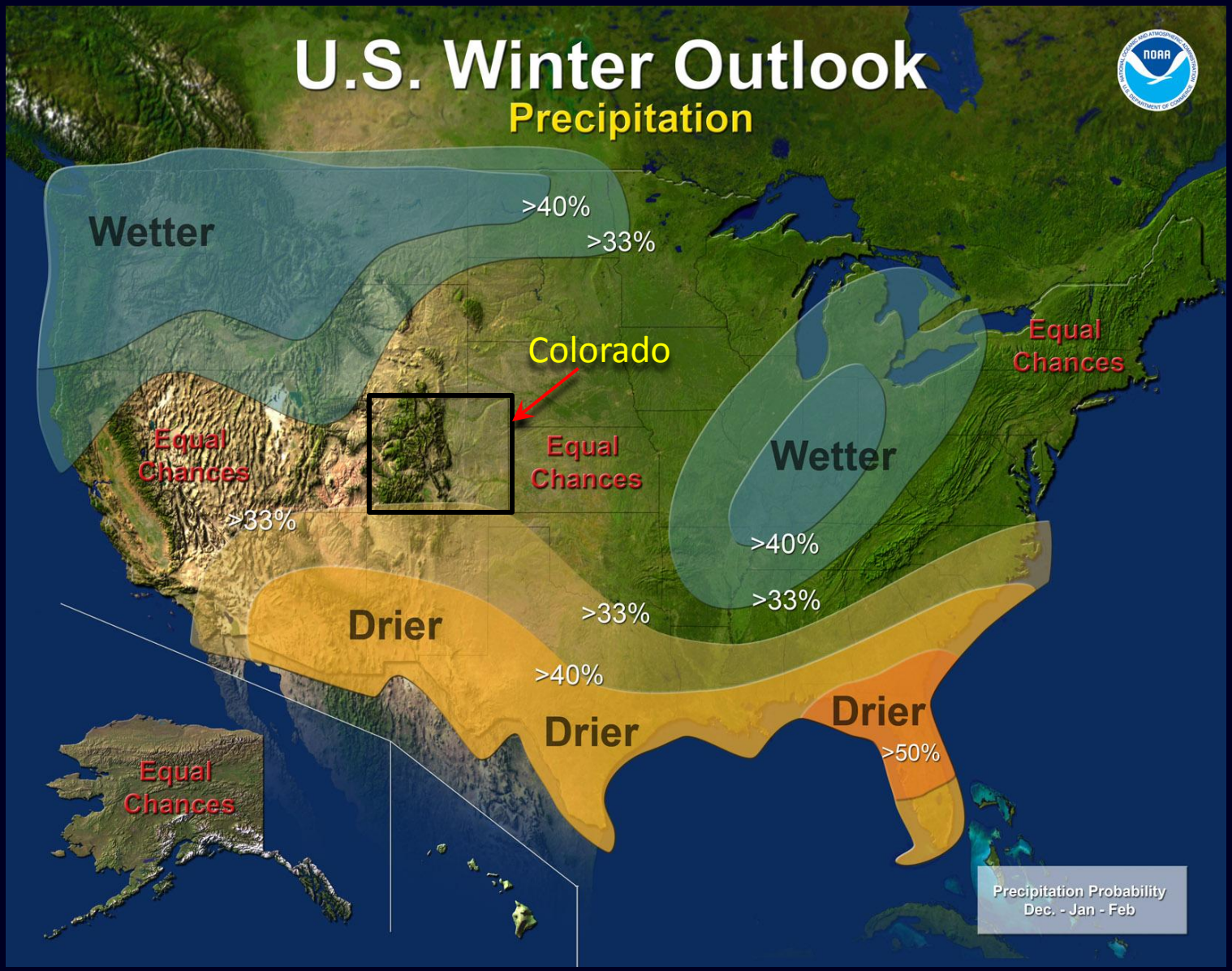
Neutral Episodes -non-ENSO (In White): ONI above -0.5 and below 0.5

NOAA/CPC Octt 2010 Baker

National Outlook for the Upcoming 2010-2011 Winter Season Released by NOAA's Climate Prediction Center

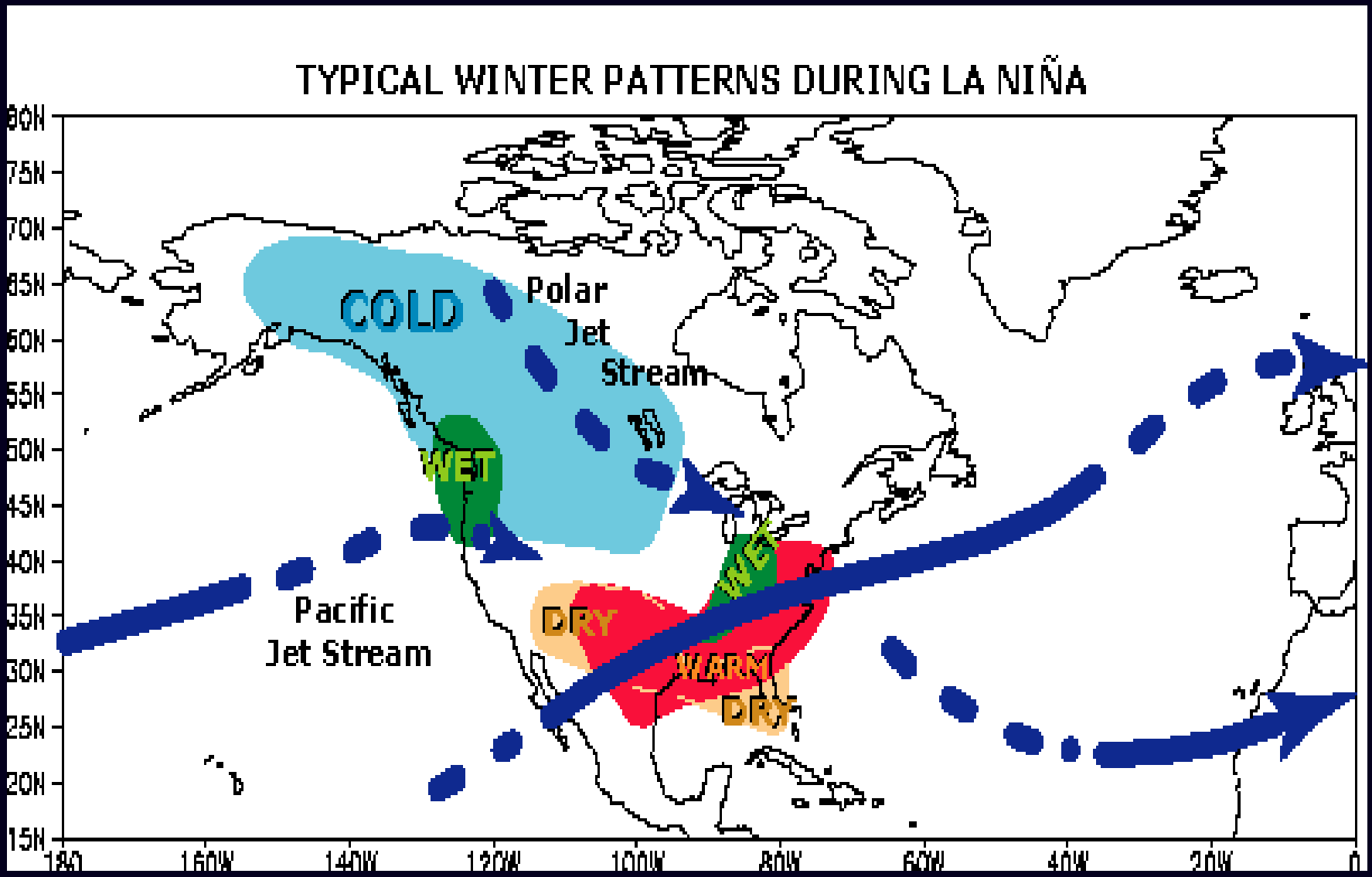


Temperature Probability for the 3-month climate season
of December, January and February
Issued by NOAA's Climate Prediction Center

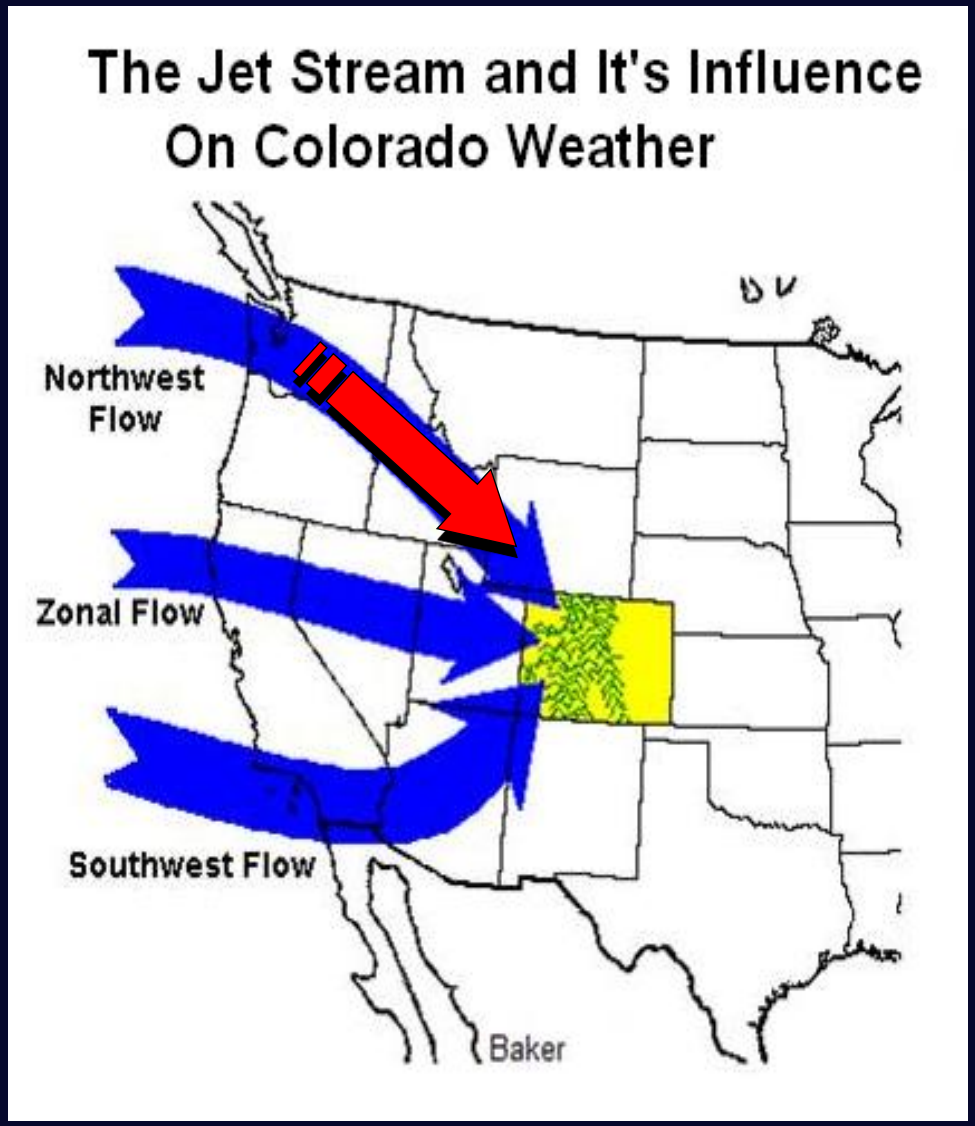


Precipitation Probability for the 3-month winter season of December, January and February
Issued by NOAA's Climate Prediction Center

Typical North American Temperature, Precipitation and Jet Stream Patterns during La Niña Winters



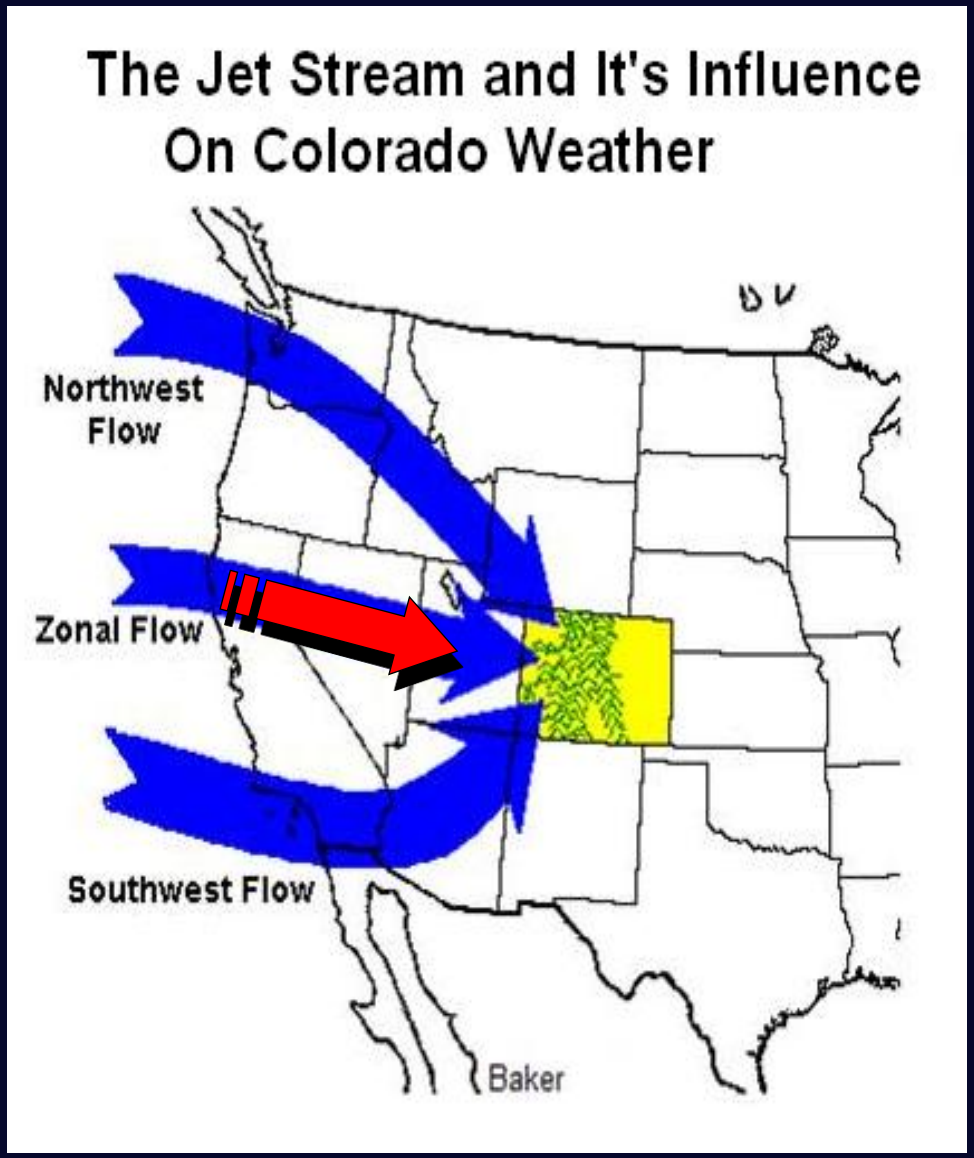
Source: NOAA/Climate Prediction Center



The Role of the Jet Stream on Colorado Weather

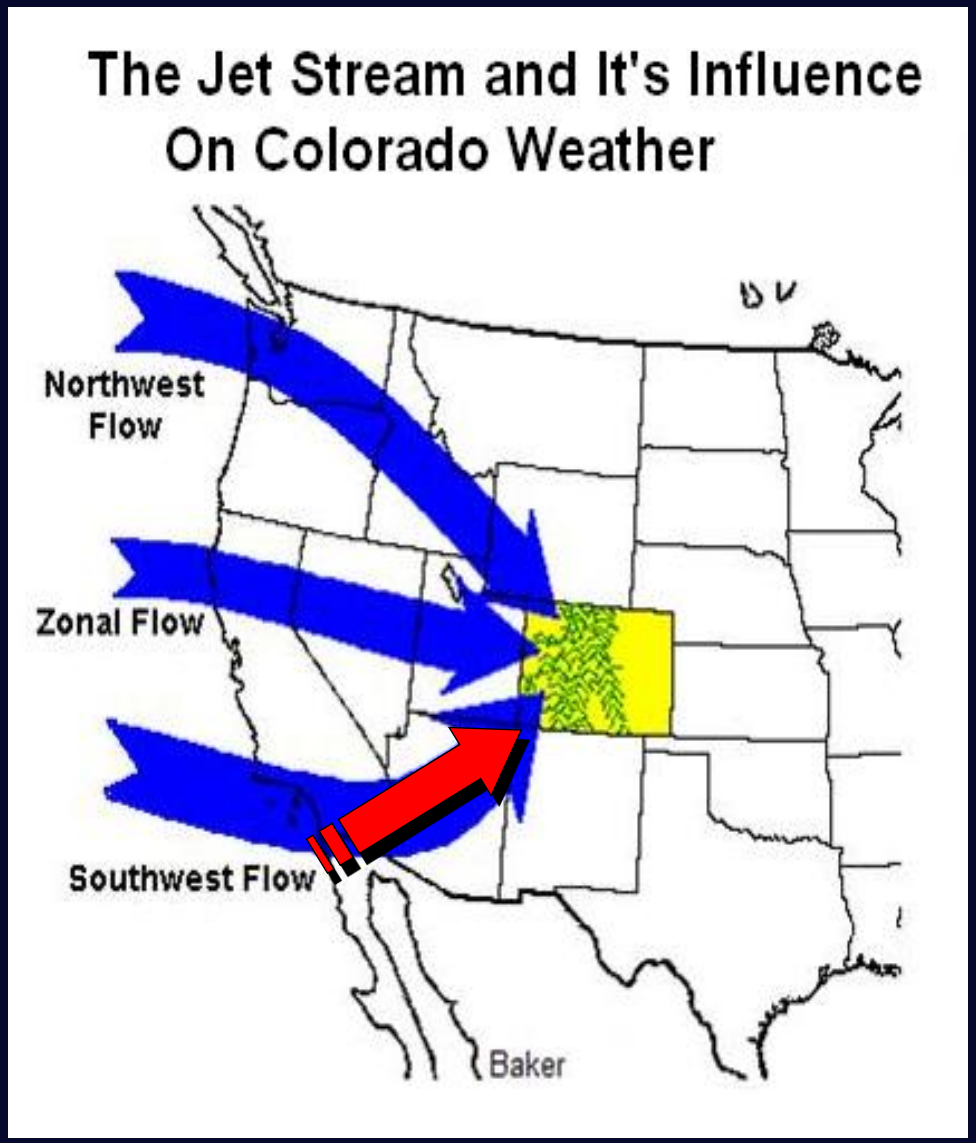
A northwest jet stream originating over the Pacific Northwest typically produces above average precipitation and below average temperatures across western Wyoming and northwest Colorado during the winter season of moderate to strong La Niñas .

This same jet stream pattern is often responsible for below average precipitation , above average temperatures and periods of strong and gusty downslope winds (Chinook and Bora wind events) east of the Continental Divide , particularly during the fall and spring of La Niña episodes.



A westerly or zonal jet stream often results in above average winter and springtime precipitation, increased cloud cover and a greater number of valley fog days across western Colorado.

This same westerly jet stream pattern is also associated with below to much below average precipitation, very low humidity and above average temperatures in areas east of the Continental Divide. There is also an increase in the number of potentially downslope wind events (mainly the warmer Chinook type winds) during the spring of La Niñas.

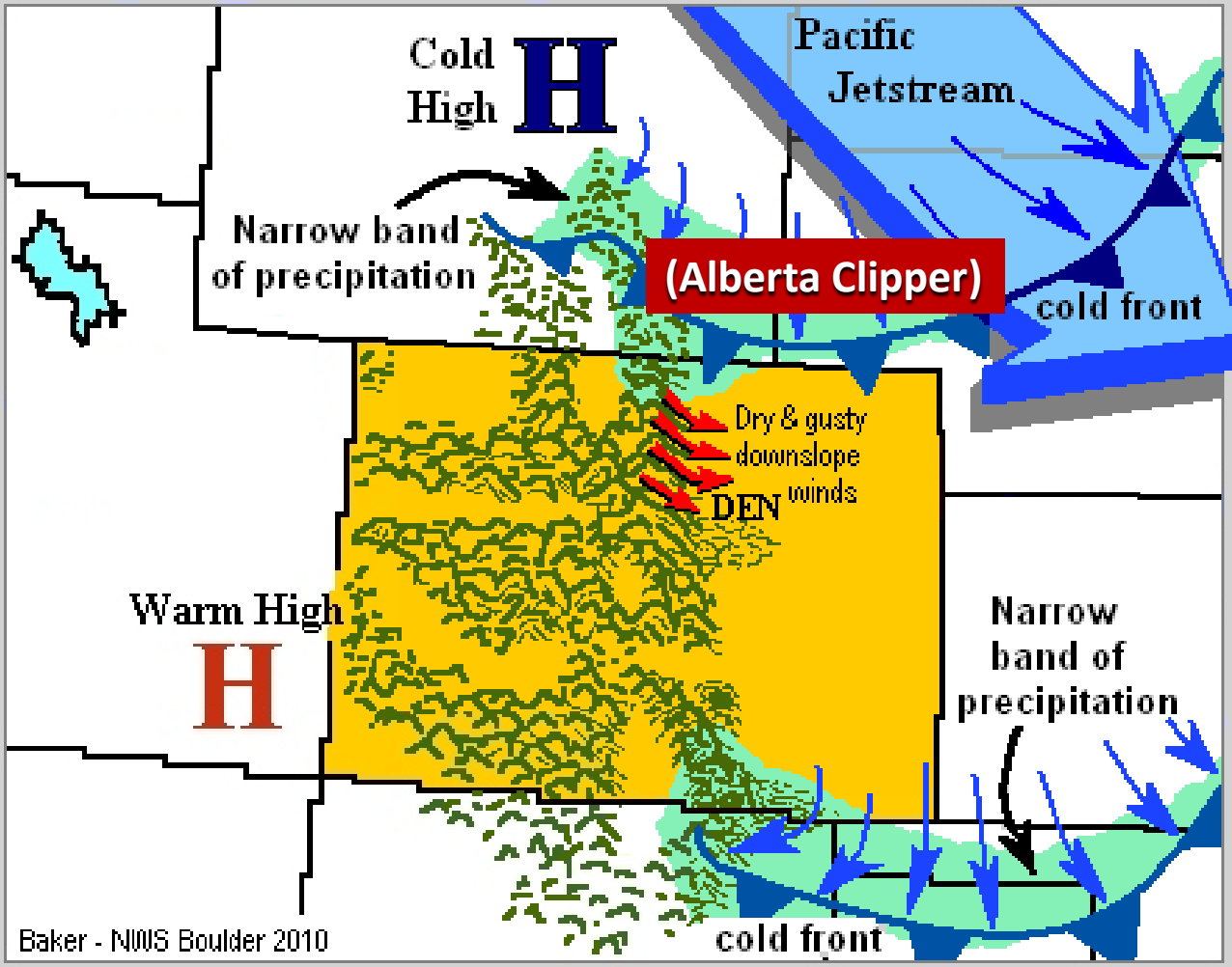


Finally, a southwest jet stream originating over the Desert Southwest is often associated with above to much above average precipitation and lower than average daytime temperatures for the Four Corners region, particularly across southwest and south central Colorado during late winter and spring of El Niño episodes.

This same jet stream pattern typically produced above average precipitation and warmer than average nighttime temperatures in areas east of the Continental Divide, particularly during the late winter and spring of moderate to strong El Niños.

Weather Patterns Prevailing Across Colorado During Moderate to Strong La Niñas.

Mean Position of the Pacific Jet Stream During the Autumn Season of Moderate to Strong La Niña Episodes

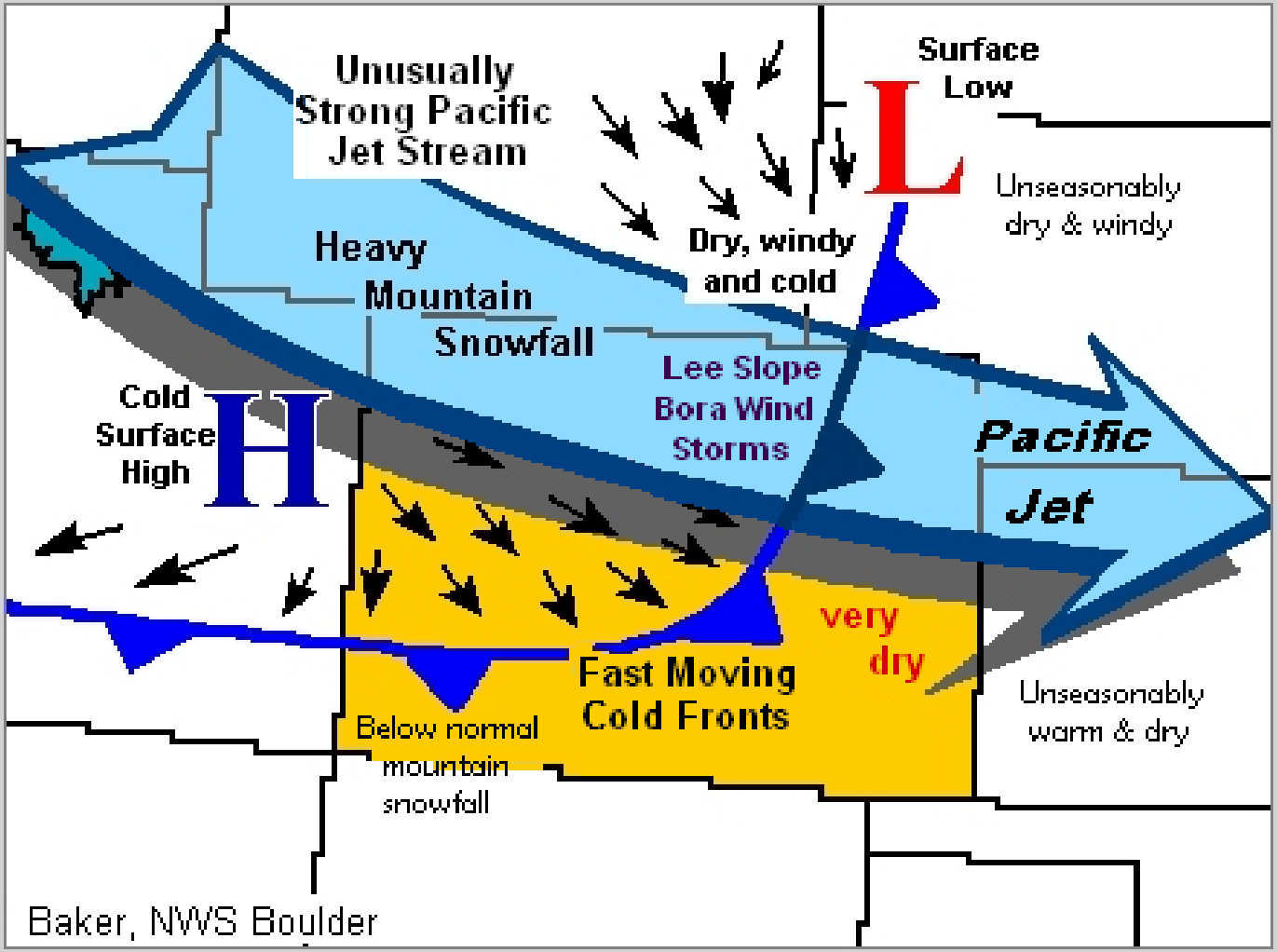


Eastern Colorado will commonly see an increase in the number of "dry" cold fronts, referred to as "Alberta clippers" during the autumn of moderate to strong La Niñas with the Pacific jet stream oriented in this position.

These fast moving cold front often produce little precipitation, and due of their fast movement, often produce strong and gusty northerly winds and sudden drops temperature.

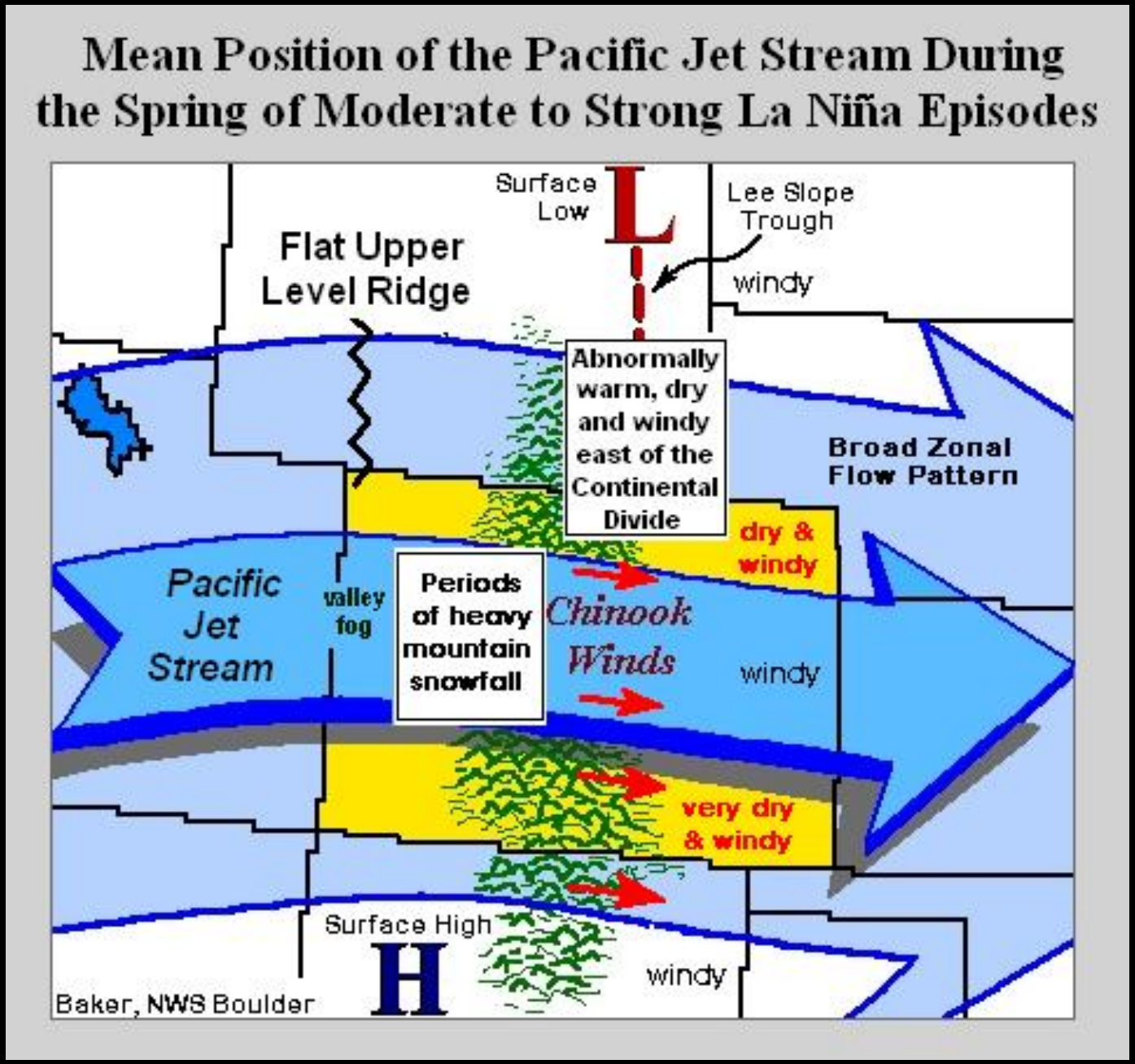
Western Colorado will feel little, if any impact from these high plains frontal systems.

Mean Position of the Pacific Jet Stream Late Autumn and Winter of Moderate to Strong La Niña Episodes



As the west coast high pressure ridge weakens and flattens, the Polar jet stream acquires more of a west-northwesterly component.

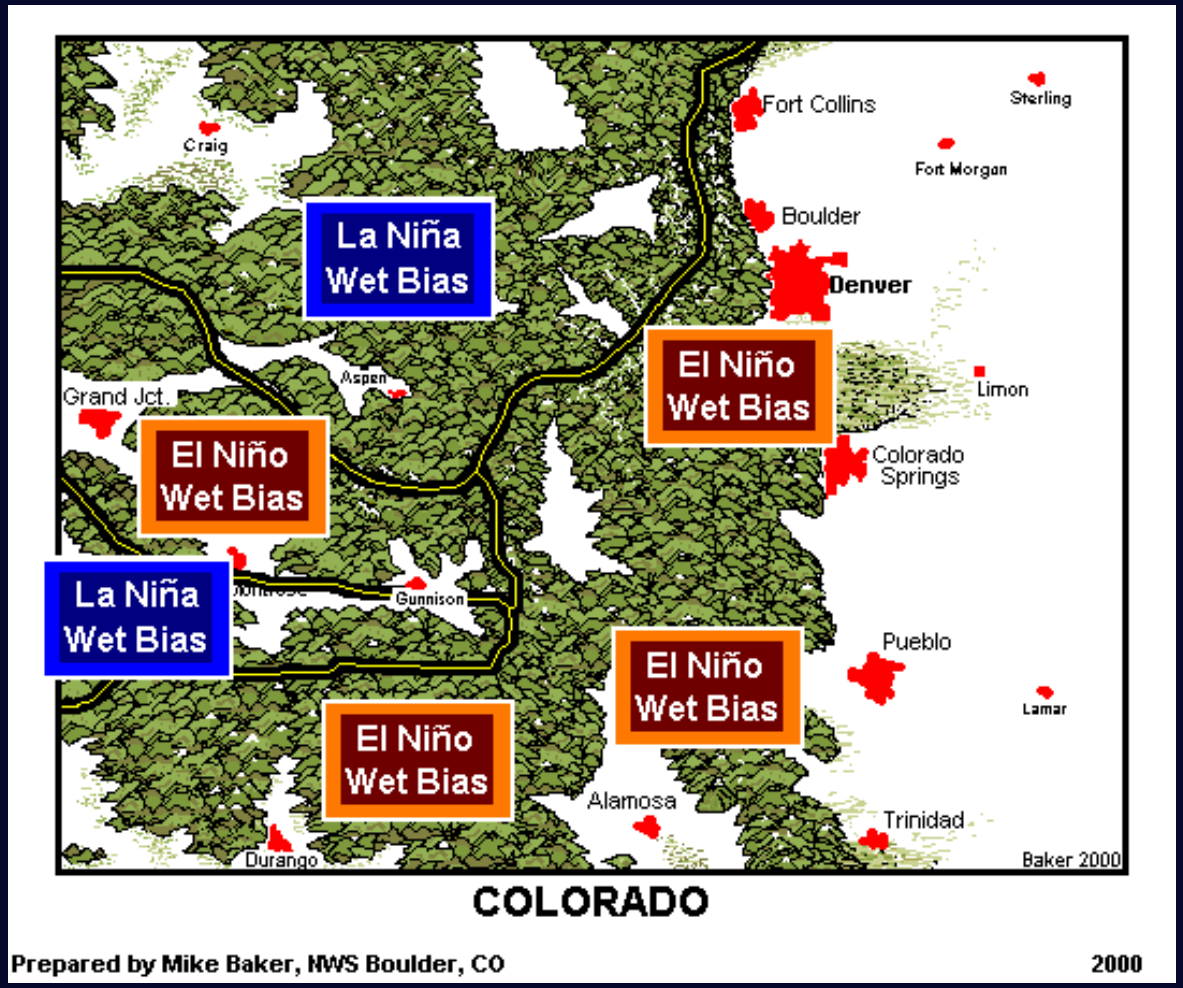
This southward shift in the jet results in an increase, often a significant increase, in precipitation and wind across the northwest plateau and north central mountains of Colorado.



In late winter and spring during the stronger La Niña episodes, the prevailing flow aloft usually becomes predominantly zonal or westerly in direction. This generally warmer and drier flow pattern still manages to produce periods of moderate to heavy snowfall on west facing mountain slopes along and west of the Continental Divide.

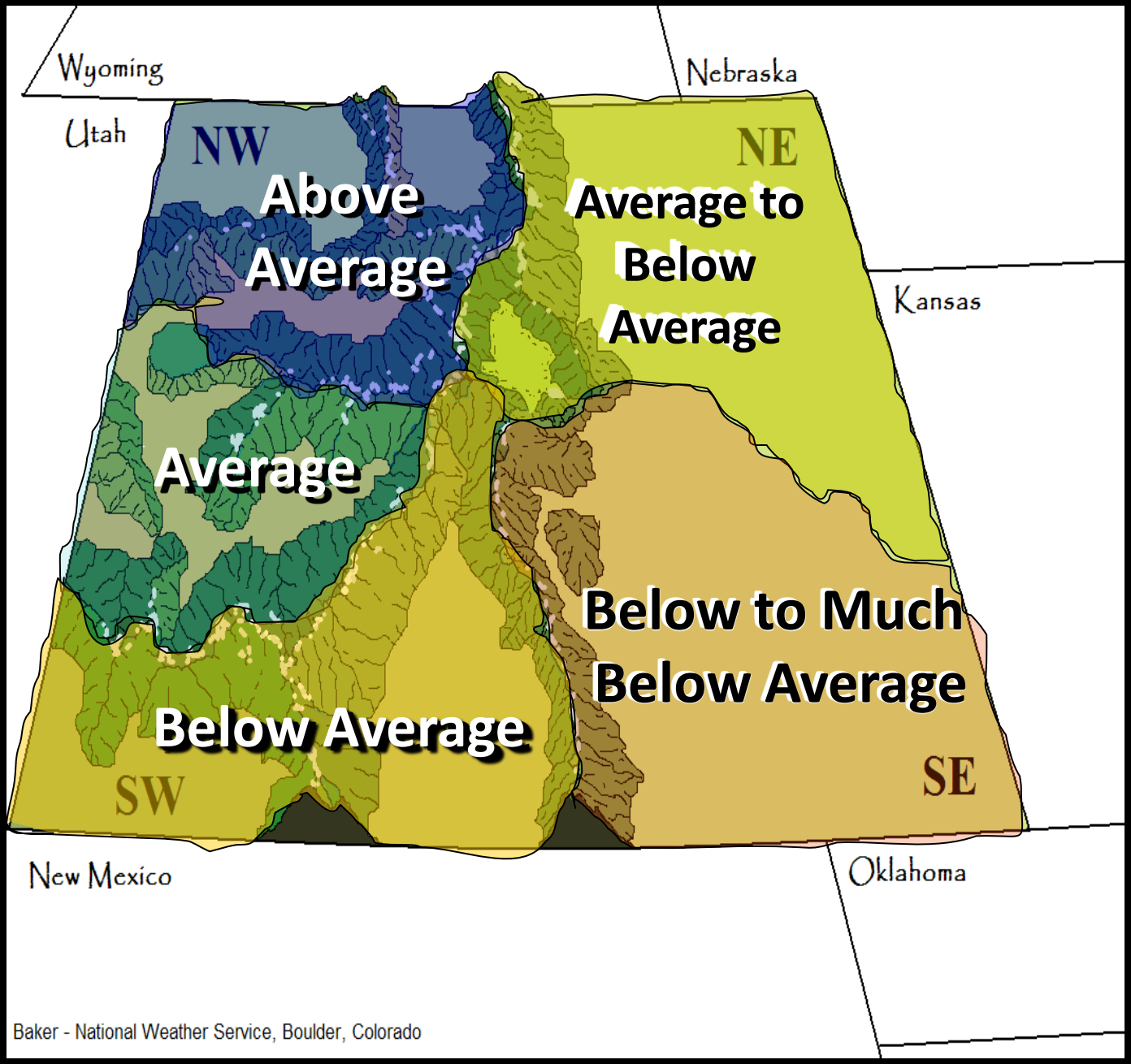
Whereas in areas east of the Divide, the weather is often abnormally warm, windy and quite dry for days, if not for weeks at a time.

Precipitation Anomalies Commonly Observed in Colorado During Moderate to Strong La Niñas and El Niños



During La Ninas of at least moderate strength, the prevailing Pacific jet stream and storm track pattern favors an above average wintertime precipitation bias over northwest Colorado as well as on northwest facing slopes of the San Juan Mountains in southwest Colorado.

During El Ninos, a southward shift in the mean wintertime jet stream and storm track favors a wet bias for areas east of the Continental Divide as well as south-southwest facing slopes of the San Juans.



Cold Season Precipitation Anomalies During La Niña Episodes

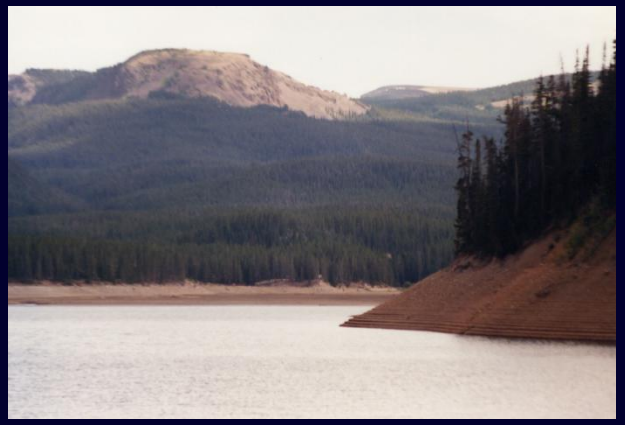
West central and northwest Colorado commonly receives AVERAGE to ABOVE AVERAGE precipitation (rain and snow) during moderate to strong La Niñas, predominately from mid-winter through mid-spring.

While southwest and eastern Colorado commonly see BELOW to MUCH BELOW AVERAGE precipitation (rain and snow) during the entire cold season of moderate to strong La Niñas.

Potential Impacts of La Niña on the Colorado Front Range

Above Average Temperatures

Below Average Precipitation and Even Drought



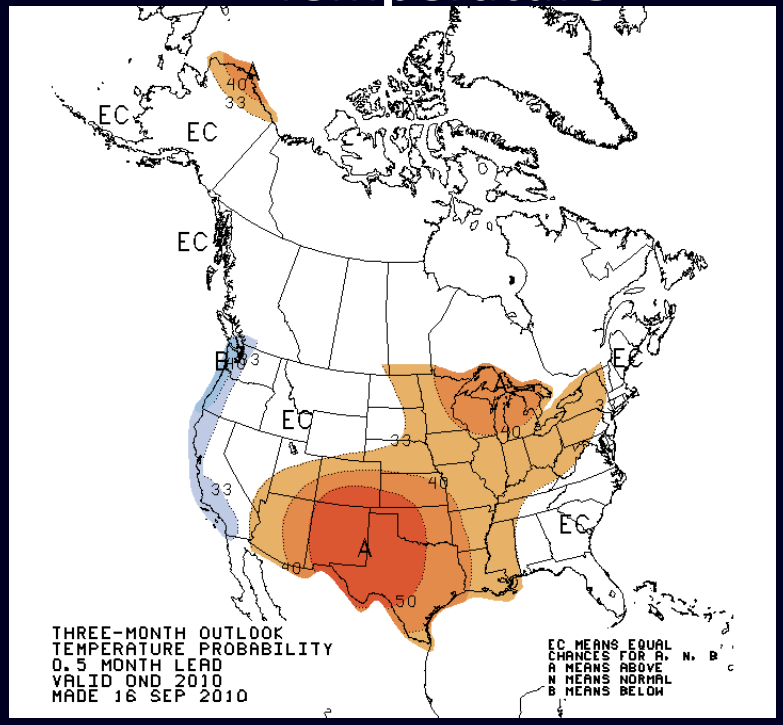
Lower Water Levels on Area Lakes and Reservoirs

Increased Wildland Fire Danger

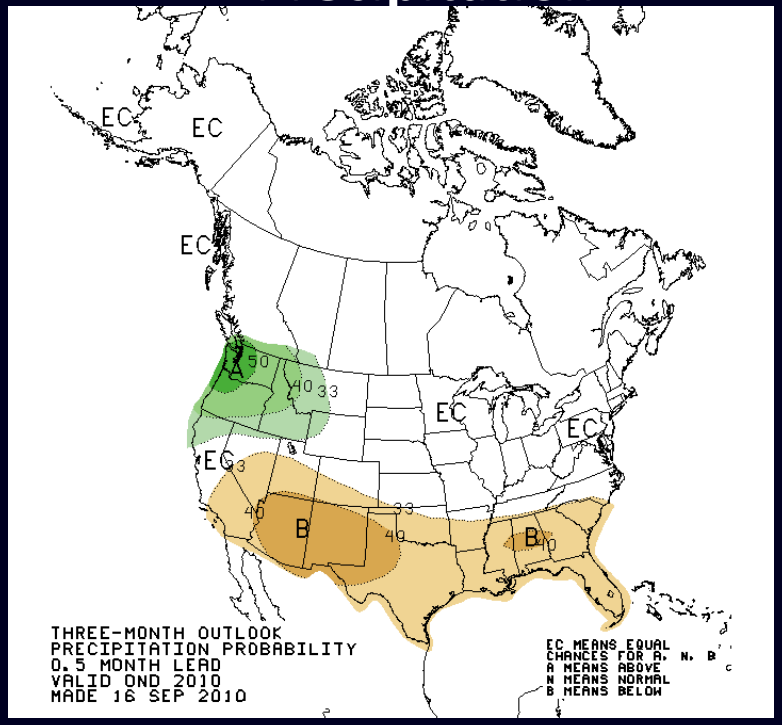
Damaging Downslope Wind Storms

U. S. Seasonal Outlooks
October - December 2010

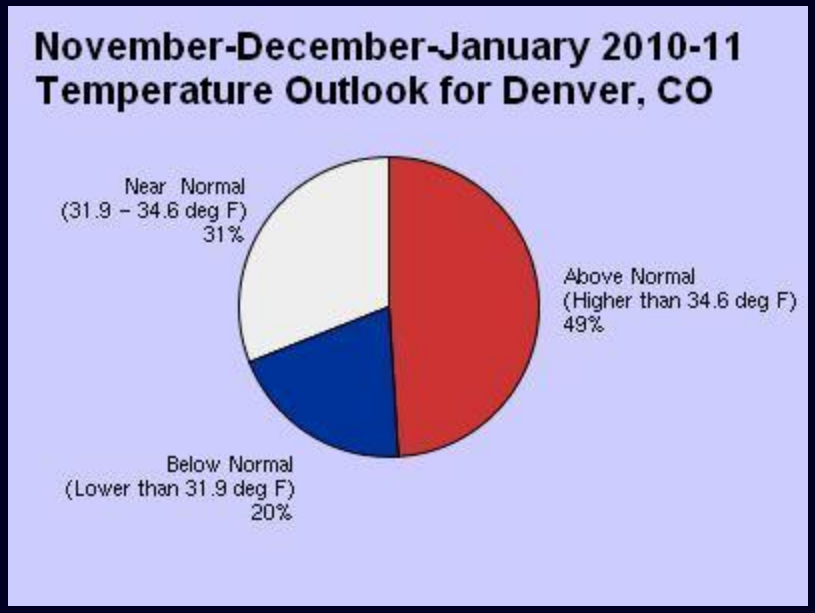
Temperature

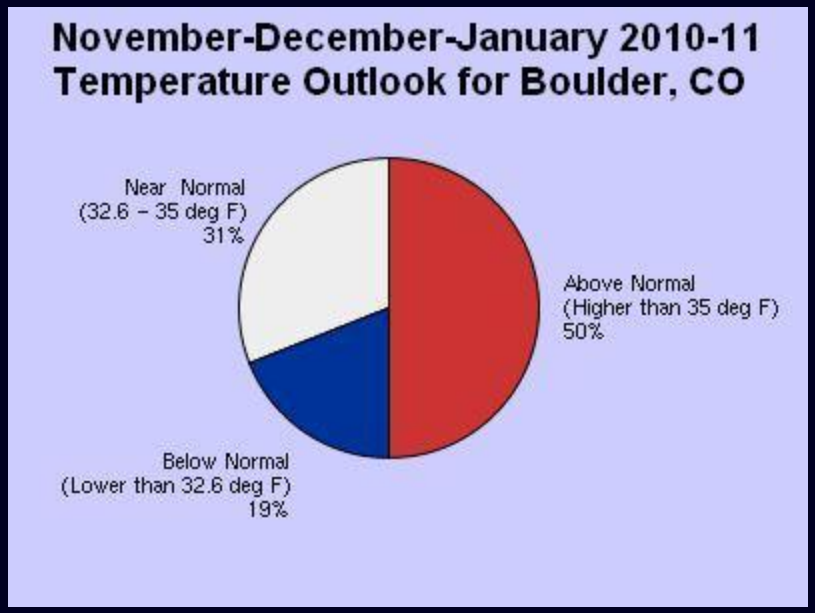


Precipitation



The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, the ENSO cycle.





Three-month Temperature Outlook for Denver and Boulder, Colorado Issued by the Climate Prediction Center

Summary

La Niña conditions are present across the central and eastern tropical Pacific Ocean.

- Equatorial SSTs are as much as 2 to 4 degrees C below average from the Date Line eastward to the South American coast.

Recent equatorial Pacific SST trends and model forecasts indicate La Niña will continue at least through the spring of 2011.

The current La Niña is forecast to produce above average temperatures and below average precipitation across most of Colorado…specifically southern and eastern portions of the state at least through the upcoming winter season.

Meanwhile the northwest and north central portions of Colorado are in line to see above average precipitation (snowfall) and below average temperatures, particularly during the latter half of this winter and perhaps through the spring of 2011.